

Claims

1. A mobile communication method, comprising:

a step in which a mobile communication apparatus determines whether a pre-movement source access router apparatus connected therewith complies with Fast Mobile IP or not;

a step in which the mobile communication apparatus during its movement detects a signal from a movement-destination access router apparatus; and

a step in which in the case where the mobile communication apparatus has determined that the pre-movement source access router apparatus does not comply with Fast Mobile IP when detecting the signal, the mobile communication apparatus requests a home agent apparatus for information on the movement-destination access router apparatus, and the home agent apparatus responds to the request, providing information on the movement-destination access router apparatus to the mobile communication apparatus, and the mobile communication apparatus instructs the home agent to forward data addressed to the mobile communication apparatus to the movement-destination access router apparatus.

2. The mobile communication method according to claim 1, wherein the home agent apparatus stores information on access router apparatuses and searches and gives information on the movement-destination access router apparatus in accordance with a request by the mobile communication apparatus.

3. The mobile communication method according to claim 1, wherein the home agent apparatus makes inquiries about information on the movement-destination access router apparatus

to an access router information server apparatus storing information on access router apparatuses, in accordance with the request by the mobile communication apparatus, and gives the information to the mobile communication apparatus.

5 4. The mobile communication method according to any one of claims 1 to 3, wherein the mobile communication apparatus notifies the home agent apparatus of an identifier tag of the movement-destination access router apparatus, and the home agent apparatus searches or inquires about information on the
10 movement-destination access router apparatus based on the identifier tag.

5. The mobile communication method according to claim 4, wherein the identifier tag of the movement-destination access router is either a lower layer address or a cell station ID.

15 6. The mobile communication method according to any one of claims 1 to 4, further comprising:

 a step in which when the home agent apparatus could not acquire information on the movement-destination access router apparatus, the home agent apparatus notifies the mobile
20 communication apparatus accordingly.

7. A mobile communication method, comprising:

 a step in which a mobile communication apparatus determines whether a pre-movement source access router apparatus connected therewith can comply with a Fast Mobile IP or not;

25 a step in which the mobile communication apparatus during the movement detects a signal from a movement-destination access router apparatus; and

a step in which in the case where the mobile communication apparatus has determined that the pre-movement source access router apparatus does not comply with Fast Mobile IP when detecting the signal, the mobile communication apparatus acquires
5 information on the movement-destination access router from an access router information server apparatus storing information on access router apparatuses, and instructs the home agent apparatus to forward data addressed to the mobile communication apparatus to the movement-destination access router apparatus.

10 8. The mobile communication method according to claim 1, comprising:

a step in which when the mobile communication apparatus determines that the pre-movement source access router apparatus does not comply with Fast Mobile IP, and the movement-destination
15 access router apparatus complies with Fast Mobile IP, the mobile communication apparatus instructs the home agent apparatus to forward data addressed to the mobile communication apparatus to the movement-destination access router apparatus;

a step in which the home agent apparatus establishes a
20 tunnel between the home agent apparatus and the movement-destination access router apparatus and notifies the establishment thereof to the mobile communication apparatus;
and

a step in which the movement-destination access router
25 apparatus receives via the tunnel data addressed to the mobile communication apparatus and forwards the data to the mobile communication apparatus.

9. The mobile communication method according to claim 8, comprising:

a step in which when the mobile communication apparatus determines that the pre-movement source access router apparatus complies with Fast Mobile IP and the movement-destination mobile IP does not comply with Fast Mobile IP, the mobile communication apparatus instructs the pre-movement source access router apparatus to forward data addressed to the mobile communication apparatus to the home agent apparatus;

a step in which the pre-movement source access router apparatus establishes a tunnel between the pre-movement source access router apparatus and the home agent apparatus and notifies the establishment thereof to the mobile communication apparatus; and

a step in which the home agent apparatus forwards data addressed to the mobile communication apparatus received via the tunnel to the mobile communication apparatus.

10. The mobile communication method according to claim 9, wherein the instruction given by the mobile communication apparatus with respect to the pre-movement source access router apparatus is one in which the address of the home agent apparatus is written in the new care-of address field of a fast binding update message according to a Fast Mobile IP procedure.

11. The mobile communication method according to claim 9 or 10, further comprising:

a step in which the home agent apparatus starts buffering in the case that buffering is possible when the home agent apparatus

receives an instruction from the pre-movement source access router apparatus for buffering transmission data addressed to the mobile communication apparatus.

12. The mobile communication method according to claim 11,
5 further comprising:

a step in which the home agent apparatus notifies the start of the buffering to the pre-movement source access router apparatus.

13. The mobile communication method according to claim 12,
10 wherein in the case that the buffering is impossible, the home agent apparatus, notifies the pre-movement source access router apparatus that buffering cannot be executed.

14. A mobile communication system comprising a network having plural sub-networks, access router apparatuses connected to the
15 sub-networks, a mobile communication apparatus making packet-communications with the network through the access router apparatuses, a home agent apparatus connected to the network which implements mobile management of the mobile communication apparatus moving between sub-networks, and at least one
20 correspondent node connecting to the network, which makes communication with the mobile communication apparatus, in which the access router apparatuses which comply with Fast Mobile IP are intermixed with those which do not comply with it, and the mobile communication apparatus, after moving to a different
25 sub-network, makes a location registration to the home agent apparatus to continue the communication with the correspondent node,

wherein the mobile communication apparatus has a function of determining whether the access router apparatus complies with Fast Mobile IP or not, and if it determines that the pre-movement source access router apparatus complies with Fast Mobile IP, 5 acquires information on the movement-destination access router apparatus from the pre-movement source access router apparatus to implement a Fast Mobile IP procedure, and if the mobile communication apparatus determines that the pre-movement source access router apparatus does not comply with Fast Mobile 10 IP, the mobile communication apparatus requests the home agent apparatus for information on the movement-destination access router apparatus, the home agent apparatus provides the information on the movement-destination access router apparatus to the mobile communication apparatus in response to the request, 15 and the mobile communication apparatus instructs the home agent apparatus to forward data addressed to the mobile communication apparatus to the movement-destination access router apparatus.

15. A mobile communication system comprising a network having plural sub-networks, access router apparatuses connecting to 20 the sub-networks, a mobile communication apparatus making packet-communications with the network through the access router apparatuses, a home agent apparatus connected to the network which implements mobile management of the mobile communication apparatus between sub-networks, at least one correspondent node 25 connecting to the network and which performs communications with the mobile communication apparatus, and an access router information server apparatus storing information on the access

router apparatuses, among which access router apparatuses which comply with a Fast Mobile IP are intermixed with those which do not comply with it, and the mobile communication apparatus, after moving to a different sub-network, makes a location registration to the home agent apparatus to continue the communication with the correspondent node,

wherein the mobile communication apparatus has a function of determining whether access router apparatuses comply with Fast Mobile IP or not, and if the pre-movement source access router complies with Fast Mobile IP, the mobile communication apparatus acquires information on the movement-destination access router apparatus from the pre-movement source access router apparatus to implement the Fast Mobile IP procedure, and if the pre-movement source access router apparatus does not comply with Fast Mobile IP, the mobile communication apparatus acquires information on the movement-destination access router apparatus from the access router information server apparatus and instructs the home agent apparatus to forward data addressed to the mobile communication apparatus to the movement-destination access router apparatus.

16. A mobile communication apparatus, comprising:

a mobile IP/Fast Mobile IP processing part for implementing standard Mobile IP processing and Fast Mobile IP processing;

an access router searching part for acquiring information on access router apparatuses from the mobile IP/Fast Mobile IP processing part;

a Fast Mobile IP compliance determining part for determining whether an access router apparatus complies with

Fast Mobile IP based on the information acquired at the access router searching part; and

a Fast Mobile IP control part for controlling the contents of a message generated by the mobile IP/Fast Mobile IP processing part based on the result of operation of the Fast Mobile IP compliance determining part.

17. The mobile communication apparatus according to claim 16, wherein the information on the access router apparatuses is acquired from a home agent apparatus which manages movements of the mobile communication apparatus between sub-networks or from an access router apparatus.

18. The mobile communication apparatus according to claim 16 or 17, wherein if the Fast Mobile IP compliance determining part determines that the pre-movement source access router apparatus does not comply with Fast Mobile IP, the Fast Mobile IP control part gives identifying information of the movement-destination access router apparatus to the home agent apparatus or an access router information server apparatus and controls the mobile IP/Fast Mobile IP processing part so as to request information on the movement-destination access router.

19. The mobile communication apparatus according to any one of claims 16 to 18, wherein when the Fast Mobile IP compliance determining part determines that the movement-destination access router apparatus complies with Fast Mobile IP based on the information on the movement-destination access router apparatus obtained from the home agent apparatus, the Fast Mobile IP control part controls the Mobile IP/Fast Mobile IP processing part so

that the home agent apparatus forwards data addressed to the mobile communication apparatus to the movement-destination access router apparatus.

20. The mobile communication apparatus according to any one
5 of claims 16 to 18, wherein when the Fast Mobile IP compliance determining part determines that the pre-movement source access router apparatus complies with Fast Mobile IP and the movement-destination access router does not comply with Fast Mobile IP, the Fast Mobile IP control part controls the Mobile
10 IP/Fast Mobile IP processing part so that the pre-movement source access router apparatus forwards data addressed to the mobile communication apparatus to the home agent apparatus.

21. The mobile communication apparatus according to claim 16, wherein the Mobile IP/Fast Mobile IP processing part sends a
15 message in which an address of the home agent apparatus is written in the new care-of address field of a fast binding update message according to a Fast Mobile IP procedure to the pre-movement source access router apparatus.

22. A home agent apparatus, comprising:
20 a mobile IP/Fast Mobile IP processing part for implementing standard Mobile IP processing and Fast Mobile IP processing;
a buffer memory for temporarily storing data addressed to the mobile communication apparatus of a management target;
and
25 a buffer management part for managing input and output to and from the buffer memory when the buffer management part receives a request for the storing of data to be sent to the

mobile communication apparatus which is received by the mobile IP/Fast Mobile IP processing part or a request for the transmission of the stored data.

23. The home agent apparatus according to claim 22, wherein
5 the buffer management part starts to buffer data when it receives a message requesting the start of buffering from the pre-movement source access router apparatus, and transmits the buffered data to the mobile communication apparatus to which the data is addressed when the buffer management part receives a message
10 requesting the start of transmission of buffered data from the movement-destination access router apparatus.

24. The home agent apparatus according to claim 22 or 23, further comprising:

a movement-destination access router searching part for
15 requesting the access router information server apparatus which stores information on access router apparatuses for information on the movement-destination access router in response to the inquiry of information on the movement-destination access router apparatus, and giving the requesting device the acquired
20 information.

25. The home agent apparatus according to claim 24, wherein the movement-destination access router searching part makes a request to the access router information server apparatus based on an identifier tag of the movement-destination access router
25 apparatus acquired when the movement-destination access router searching part receives the request from the mobile communication apparatus.

26. The home agent apparatus according to claim 24 or 25, further comprising:

an access router information list in which identifier tags of access router apparatuses, IP addresses of the access router apparatuses, and the compliance/noncompliance with Fast Mobile IP of the access router apparatuses are written; and

an access router information searching part for searching for entries corresponding to the identifier tag included in the received message requesting information on an access router apparatus, and

wherein the movement-destination access router searching part instructs the access router information searching part to search for information on the movement-destination access router apparatus in response to the request.

27. The home agent apparatus according to claim 25 or 26, wherein the identifier tag of the access router apparatus is either a lower layer address or a cell station ID.

28. An access router information server apparatus, comprising:

an access router information list in which identifier tags of access router apparatuses, IP addresses of the access router apparatuses and the compliance/noncompliance with Fast Mobile IP of the access router apparatuses are written;

a receiving part for receiving requests for information on the access router apparatuses from various kinds of apparatuses on the network;

an access router information searching part for searching the access router information list for entries corresponding

to the identifier tag included in the received request; and
an access router information notifying part for notifying
the requesting apparatus of the search result.

29. The access router information server apparatus according
5 to claim 28, wherein the identifier tag of the access router
is either a lower layer address or a cell station ID.

30. The mobile communication method according to claim 8,
comprising:

a step in which if the mobile communication apparatus
10 determines that the movement-destination access router apparatus
does not comply with Fast Mobile IP, the mobile communication
apparatus instructs the pre-movement source access router
apparatus to forward data addressed to the mobile communication
apparatus to the home agent apparatus;

15 a step in which the home agent apparatus forwards the data
addressed to the mobile communication apparatus which is
received from the pre-movement source access router apparatus
to a buffer node which stores data temporarily;

a step in which when the home agent apparatus receives
20 notification of the completion of handover from the mobile
communication apparatus, the buffer node is instructed to
transmit data addressed to the mobile communication apparatus
to the mobile communication apparatus; and

a step in which when the buffer node receives the instruction
25 for the transmission the buffer node transmits the stored data
addressed to the mobile communication apparatus to the mobile
communication apparatus indicated in the instruction.

31. The mobile communication method according to claim 30, further comprising:

a step in which when the home agent apparatus receives a buffer request message from the pre-movement source access router apparatus, the home agent apparatus transmits a request
5 for storing data to the buffer node; and

a step in which the buffer node sends a response answering whether it can store data to the home agent apparatus when it receives the buffer request message.

10 32. The mobile communication method according to claim 30, wherein a tunnel is established in the data transmission between the home agent apparatus and the buffer node or the data transmission between the buffer node and the mobile communication apparatus or both.

15 33. The mobile communication system, further comprising:

a buffer node for temporarily storing data,
wherein the home agent apparatus instructs the temporary storing of data transmitted to the buffer node and the transmission of that data to the designated mobile communication apparatus, and
20 the buffering node stores received data and later forwards the data to the designated mobile communication apparatus.

34. A home agent apparatus, comprising:

a mobile IP/Fast Mobile IP processing part for implementing standard Mobile IP processing and a Fast Mobile IP processing;

25 a data forwarding part for forwarding data addressed to the mobile communication apparatus being managed that has been received by the mobile IP/Fast Mobile IP processing part, to

an external storage apparatus; and

5 a message generating part for generating a message which instructs the storing of data addressed to the mobile communication apparatus that has been transmitted by the data forwarding part and a message which instructs the transmission of the data stored in the external storage apparatus to the mobile communication apparatus, and for requesting the mobile IP/Fast Mobile IP processing part to send the message to the external storage apparatus.